

```

SetDirectory["C:\\drorbn\\AcademicPensieve\\Projects\\WKO/"]
C:\\drorbn\\AcademicPensieve\\Projects\\WKO

size = 120;
s1[t_] := 1 + 0.5 (1 - t) (1 + t); s2[t_] := 1 - 0.25 (1 - t) (1 + t);
tilt[t_] := 0 + 0.5 (1 - t) (1 + t);
p1[t_] := {1.25 t, 0, -0.3 Sin[ $\pi$  t]}; p2[t_] := -p1[t];
Ring[p_, s_, tilt_] := Tube[
  Table[
    p + s {Cos[ $\theta$ ] Cos[tilt], Sin[ $\theta$ ], Cos[ $\theta$ ] Sin[tilt]},
    { $\theta$ , 0, 2  $\pi$ , 2  $\pi$  / 72}
  ], 0.24 s
];
RedBlueRings[t_] := Graphics3D[{
  Red, Ring[p1[t], s1[t], tilt[t]],
  Blue, Ring[p2[t], s2[t], tilt[t]]
},
  ViewPoint  $\rightarrow$  {0, -3, 1.5}, Boxed  $\rightarrow$  False, ImageSize  $\rightarrow$  size
];
{{p1[t], s1[t], tilt[t]}, {p2[t], s2[t], tilt[t]}} /. t  $\rightarrow$  -1
{{{-1.25, 0, 0.}, 1., 0.}, {{1.25, 0, 0.}, 1., 0.}}

size = 480;
TheVertex = (
  Rasterize[#, RasterSize  $\rightarrow$  480] & /@
  {
    purplering = Graphics3D[{
      Purple, Ring[{0, 0, 0}, 1, 0]
    },
    ViewPoint  $\rightarrow$  {0, -3, 1.5}, Boxed  $\rightarrow$  False, ImageSize  $\rightarrow$  480
  ],
  purplering,
  Graphics3D[{
    Red, Ring[{0, 0, 0}, 1.3, 0],
    Blue, Ring[{0, 0, 0}, 0.8, 0]
  },
  ViewPoint  $\rightarrow$  {0, -3, 1.5}, Boxed  $\rightarrow$  False, ImageSize  $\rightarrow$  480
  ],
  RedBlueRings[0],
  RedBlueRings[-1 / 2],
  RedBlueRings[-1]
  }
) // GraphicsColumn

Export["TheVertex.png", TheVertex]

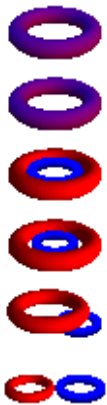
TheVertex.png

```

```

size = 60;
TheNegativeVertex = (
  Rasterize[#, RasterSize → size] & /@
  {
    purplering = Graphics3D[{
      Purple, Ring[{0, 0, 0}, 1, 0]
    },
    ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
  ],
  purplering,
  Graphics3D[{
    Red, Ring[{0, 0, 0}, 1.3, 0],
    Blue, Ring[{0, 0, 0}, 0.8, 0]
  },
  ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
  ],
  RedBlueRings[0],
  Graphics3D[{
    Red, Ring[{-0.625`, 0, 0.3`}, 1.375`, 0.`,`],
    Blue, Ring[{0.625`, 0, -0.3`}, 0.8125`, 0.`,`]
  },
  ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
  ],
  RedBlueRings[-1]
  }
) // GraphicsColumn

```



```
Export["TheNegativeVertex.png", TheNegativeVertex]
```

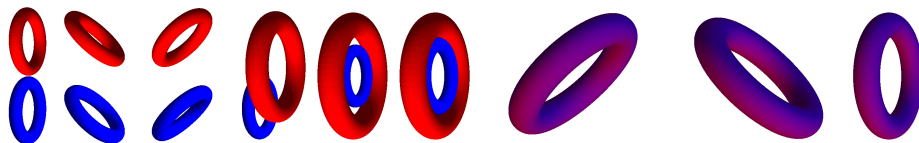
```
TheNegativeVertex.png
```

```

size = 480;
t = (
  Rasterize[#, RasterSize → size, ImageSize → size] & /@
  {
    Graphics3D[{
      Purple, Ring[{0, 0, 0}, 1, 0]
    },
      ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
    ],
    Graphics3D[{
      Purple, Ring[{0, 0, 0}, 1,  $\pi/4$ ]
    },
      ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
    ],
    Graphics3D[{
      Purple, Ring[{0, 0, 0}, 1,  $3\pi/4$ ]
    },
      ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
    ],
    Graphics3D[{
      Red, Ring[{0, 0, 0}, 1.3, 0],
      Blue, Ring[{0, 0, 0}, 0.8, 0]
    },
      ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
    ],
    RedBlueRings[0],
    RedBlueRings[-1/2],
    Graphics3D[{
      Red, Ring[{-1.25^, 0, 0.^}, 1.^,  $3\pi/4$ ],
      Blue, Ring[{1.25^, 0, 0.^}, 1.^,  $3\pi/4$ ]
    },
      ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
    ],
    Graphics3D[{
      Red, Ring[{-1.25^, 0, 0.^}, 1.^,  $\pi/4$ ],
      Blue, Ring[{1.25^, 0, 0.^}, 1.^,  $\pi/4$ ]
    },
      ViewPoint → {0, -3, 1.5}, Boxed → False, ImageSize → size
    ],
    RedBlueRings[-1]
  }
);

```

```
TheTwistedVertex = ImageRotate[ImageAssemble[List /@ t], Right]
```



```
Export["TheTwistedVertex.png", TheTwistedVertex]  
TheTwistedVertex.png
```